SPECIFICATION

DEFLECTION YOKE AND COLOR PICTURE TUBE COMPRISING THE SAME

Technical Field

The present invention relates to a deflection yoke mounted in a color picture tube (hereafter "CRT") used, for instance, in a television set or a computer display, and a CRT which uses such a deflection yoke, and in particular the structure of the deflection yoke.

Background Art

Conventionally, amongst deflection yokes used in self-convergence systems which are mounted in in-line type CRTs, there are deflection yokes known as bend-up-less types. The following explains the structure of a conventional bend-up-less type deflection yoke. FIG. 1 is an outline cross section showing the structure of a conventional bend-up-less type deflection yoke schematically.

As shown in this drawing, a bend-up-less type deflection yoke 6 is composed of a saddle-shaped horizontal deflection coil 11 mounted along the inner surface of an insulating frame 13, and a saddle-shaped vertical

deflection coil 12 mounted along and sandwiched between the outer surface of the insulating frame 13 and a ferrite core 14, and the deflection yoke 6 has a structure in which an electron gun side bend portion 17 of the horizontal deflection coil 11 and the vertical coil 12 (the section in the drawing surrounded by a broken line) substantially lines the outer surface of a CRT funnel 4. Please note that reference numeral 15 in the drawing designates a correction coil which corrects so-called VCR (vertical coma residual) and side beams (R,B) vertical mis-convergence that occurs and is provided on the outer surface slightly forward in the electron beam emission direction from a main lens 51 of an electron gun 5. Reference numeral 31 in the drawing designates a member for fixing the correction coil 15 known as a back cover or a small cover (hereafter "back cover 31"), the function of which will be described later.

Generally, the closer the placement position of a saddle-shaped deflection coil is to the electron gun side, the closer the deflection center is to the electron gun side, improving deflection sensitivity, and reducing the power needed to deflect the electron beam. As a result, deflection power can be reduced. Compared, for example, with bend-up type deflection yokes used conventionally,

in other words, deflection yokes with a structure in which the electron gun side bend portion of the deflection coil protrudes from the outer surface of the funnel, the placement position of the deflection coil of a bend-up-less type deflection yoke can be closer to the electron gun side. Therefore, bend-up-less type deflection yokes have the advantage of having higher deflection sensitivity and reduced deflection power compared with bend-up type deflection yokes. These bend-up-less type deflection yokes are particularly effective in broad deflection angle CRT apparatuses which have become commonly used in recent years. Consequently, the current situation is that bend-up-less type deflection yokes are used in almost all broad deflection angle CRT apparatuses.

Bend-up-less type deflection yokes have the advantages described above, but conventional bend-up-less type deflection yokes have a problem that there are cases in which the manufacturing process is inefficient because of the structure.

Namely, in bend-up-less type deflection yokes, when the correction coil 15 is placed on top of the electron gun side bend portion 17, a member for fixing and positioning the correction coil 15 must be provided protruding greatly above the electron gun side bend portion

17. This is because when the insulating frame 13 and the protruding member are integrally formed, the vertical deflection coil 12 must be inserted in the gap between the protruding member and the insulating frame 13 during assembly of the deflection yoke, making assembly impossible or extremely inefficient.

Subsequently, in conventional bend-up-less type deflection yokes, generally the back cover 31 shown in FIG. 1 is used as a component for fixing and positioning the correction coil 15 while avoiding interfering with the vertical deflection coil 12. The correction coil 15 is mounted on the back cover 31 in advance, and after the vertical coil 12 is mounted on the insulating frame 13, the fixing and positioning of the correction coil 15 is performed by inserting the back cover 31 from the electron gun side of the insulating frame 13.

However, when a bend-up-less type deflection yoke is manufactured using the back cover 31, the back cover 31 is an extra necessity. As a result the cost of the component and the process for applying the component cannot be avoided, giving rise to a problem of a necessary increase in the manufacturing cost.

The present invention comes about in view of the above problems, and has an objective of providing a deflection

yoke that is easily assembled particularly when assembling bend-up-less type deflection yokes and enables the manufacturing cost to be cut, and a CRT apparatus that uses such a deflection yoke.

Disclosure of the Invention

A deflection yoke of the present invention is a deflection yoke including a saddle-shaped horizontal deflection coil, a saddle-shaped vertical deflection coil, an insulating frame, and a correction coil, the saddle-shaped horizontal deflection coil and the saddle-shaped vertical deflection coil being provided along, respectively, an inner and an outer surface of the insulating frame which insulates the deflection coils, and the correction coil being provided above the outer surface of an electron gun side bend portion of the deflection coils, a setting member provided in a fixed positional relation with respect to the insulating frame on the electron gun side and behind the bend portion of the deflection coils, and the correction coil set at a fixed position on a wall surface of the setting member which faces the screen and above the outer surface of the electron gun side bend portion.

According to this construction, the correction coil

can be easily mounted after the vertical deflection coil has been mounted on the insulating frame, therefore in particular a bend-up-less type deflection yoke can be easily assembled.

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Here, if the setting member is integrally formed with the insulating frame, there is no need to use a back cover which is used conventionally, meaning that as well as reducing component costs, the process to insert the back cover is unnecessary, so the manufacturing cost of the diffusion yoke can be reduced.

In addition, if the correction coil is structured to be freely detachable from the setting member, serviceability is convenient in the case that a fault occurs in the correction coil or either of the deflection coils.

Brief Description of the Drawings

FIG. 1 is an outline cross sectional view showing the structure of a conventional bend-up-less type deflection yoke;

FIG. 2 is an outline cross sectional view showing an example of the structure of a CRT apparatus to which the present invention is applied;

FIG. 3 is a perspective diagram showing an example

of the structure of the deflection yoke in one mode for carrying out the present invention;

FIG. 4 is a vertical section (the section showing the correction coil 15 is a side view) showing an outline of the structure of the deflection yoke 6 in one mode for carrying out the present invention;

FIG. 5 is a three-view drawing showing an example of the structure of the correction coil 15 in a mode for carrying out the present invention;

FIG. 6 is an enlarged view showing the section of the deflection yoke in a mode for carrying out the present invention that fixes the correction coil 15;

FIG. 7 is a drawing representing the state of the magnetic field of the correction coils 15 which use a U-shaped core;

FIG. 8 is a pattern drawing of mis-convergence of vertical coma residual (VCR);

FIG. 9 is a pattern drawing of vertical mis-convergence which occurs in the side beams (R,B);

FIG. 10 is a drawing representing the state of the magnetic field of the correction coils 15 which use an E-shaped core;

FIG. 11 is a perspective diagram showing an example of the structure of the deflection yoke 6 using an E-shaped

core;

FIG. 12 is a drawing representing the state of the magnetic field of the correction coils 15 which use a U-shaped core and an I-shaped core in combination;

FIG. 13 is a perspective diagram showing an example of the structure of the deflection yoke 6 using a U-shaped core and an I-shaped core in combination;

FIG. 14 is a perspective diagram showing an example of the structure of the deflection yoke 6 when the correction coil 15 is fixed by providing insertion apertures 31 in the plate 16 and inserting the tips of the fixing member 26 into the insertion apertures 31;

FIG. 15 is an enlarged drawing of the insertion aperture 31 portion; and

FIG. 16 is a perspective diagram showing an example of the deflection yoke 6 when the width of the portion of the plate 16 on which the correction coil 15 is mounted is narrower than the remainder.

Best Mode for Carrying Out the Invention

The following explains a best mode for carrying out the present invention based on the drawings.

FIG. 2 is an outline cross section showing an example

of a CRT apparatus to which the present invention is applied. In the CRT apparatus 1 shown in this figure an outer envelope is formed by a funnel 4 and a front panel 3 which has a fluorescent screen surface 2 on the inner surface, and an electron gun 5 which emits an electron beam 7 on the inner neck portion of the funnel 4 is provided. In addition, a deflection yoke 6 of the present invention is mounted along the outer surface of the neck portion of the funnel 4.

FIG. 3 is a perspective drawing showing an example of an outline of a structure of the deflection yoke 6 of a mode for carrying out the present invention. FIG. 4 is a cross section showing an outline of the structure of the deflection yoke 6 (the correction coil 15 section is a side view). Please note that the funnel 4, the electron gun 5, and the ferrite core 14 of the deflection yoke 6 of the CRT shown in FIG. 4 are omitted in FIG. 3.

The deflection yoke 6 of the present mode for carrying out the invention includes a saddle-shaped horizontal deflection coil 11 provided along the outer surface of the funnel 4, a vertical deflection coil 12 provided along the outer surface of the horizontal deflection coil 11, an insulating frame 13 which insulates the horizontal deflection coil 11 and the vertical deflection coil 12,

a ferrite core 14 provided on the outer periphery of the vertical deflection coil 12, and a correction coil 15 provided slightly forward in the electron beam emission direction above the outer surface of a main lens 51 of the electron gun 5, and the deflection yoke 6 is a bend-up-less type deflection yoke having a structure in which an electron gun side bend portion 17 (the section in the drawing surrounded by a broken line) substantially lines the outer perimeter of the CRT funnel 4.

In the present mode, a plate 16 almost parallel to the screen surface is provided integrally with the insulating frame 13 on the end of the electron gun side of the insulating frame 13 and the correction coil 15 is fixed to the screen side of the plate 16 (Below, the front side of the direction in which the electron beam progresses is called the "screen side" and the opposite direction is called the "electron gun side". The "electron gun side rear portion" means being further towards the electron gun side than the tip of the electron gun 5.). In this way, the positioning of the correction coil 15 at the screen side of the plate 16 is the gist of the invention. Please note that in the present mode the insulating frame 13 and the plate 16 are integrally formed. This is suitable for reducing manufacturing costs as the number of components

can be reduced, but the insulating frame 13 and the plate 16 may be made as separate members and assembled in advance of mounting the correction coil 15, for example before mounting the vertical deflection coil 12. Even by this method the effect that the deflection yoke 6 can be manufactured more easily compared to conventional methods can be obtained.

In the present mode, correction coils 15 are fixed at the top and the bottom, as seen from the screen, provided above the outer surface of the electron gun side bend portion 17 protruding from the plate 16, while being freely detachable from the plate 16.

FIG. 5 is a three-view drawing showing an example of the structure of the correction coil 15 in the present mode. The correction coil 15 is formed from a U-shaped core 22 made from ferrite and having both legs pointing towards the electron gun side bend portion 17, a bobbin 23 mounted substantially in the center of the bottom portion of the U-shaped core 22, opposing flange portions 25 provided set on either side of the bobbin 23, and fixing members 26 provided on either side of the bottom portion of the U-shaped core 22. A conductive wire, which is not shown in FIG. 5, is wound around the bobbin 23 in order to form the correction coil 15. Please note that in the present

mode, the fixing member 26 is made of plastic and is fixed to the U-shaped core 22 with an adhesive.

Returning to FIG. 3, in the correction coil 15 in the present mode, the correction coil 15 and the plate 16 are fixed by the flange portions 25 contacting the screen side of the plate 16 and regulating the distance of the correction coil 15 from the plate 16, and claw portions 27 which are provided on the ends of the fixing members 26 being attached with a rectangular notch portions 28 which are provided on the edge of the plate 16. FIG. 6 is an enlarged view of the section where the notch portion 28 and the claw portion 27 interlock. In the present mode, the provision of the flange portions 25 makes the positioning of the correction coil 15 easy, but according to, for instance, the material of the fixing member 26, it is possible that the placement of the correction coil 15 may be possible by the interlocking of the claw portions 27 and the notch portions 28. In such cases it may not be necessary to provide the flange portions 25.

Each correction coil 15 in the present mode, as shown in FIG. 7, is a conductive wire 24 wound around the U-shaped ferrite core 22, and generates a six-pole magnetic field synchronizing a vertical deflection and performs optimum correction of a VCR of a pattern shown in FIG. 8.

In addition, other conductive wire is further wound around each of the correction coils 15, controlling the magnetic field of the conductive wire and, the correction coils 15 also performs the function of generating a four-pole magnetic field in the same cores 22 and correcting vertical mis-convergence of side beams (R,B) shown in the pattern in FIG. 9. The working of the correction coil 15 itself is already well known, therefore an explanation will be omitted. However the correction coil 15 may be structured to correct either one or both of the above-described VCR and vertical mis-convergence.

Ins+ A5 An E-shaped ferrite core 29, as shown in FIG. 10, having conductive wire 24 wound around each leg portion may be used as the correction coil 15. When this kind of E-shaped core 29 is used, as is shown in an example of the structure in FIG. 11, it is desirable to mount a correction coil 15 on both the right side and the left side as seen from the screen side. This case is the same as when the U-shaped core 22 is used in that the correction coil 15 can be constructed to correct the VCR and the vertical mis-convergence of the side beams (R,B) by winding different conductive wires around the ferrite core 29 and controlling the magnetic field.

In addition, as shown in FIG. 12, the correction coil

15 may be constructed by combining the U-shaped core 22 and an I-shaped core 30. In this case, for example, the correction coils 15 can be mounted as shown in FIG. 13 in an example of the construction.

Please note that, as explained above, the structure in which the notch portion 28 and the claw portion 27 are interlocked at the edge of the plate 16 is merely one example of mounting the correction coil 15 on the plate 16 in the deflection yoke 6 of the present invention, and many other methods of mounting are possible. For example, as shown in FIG. 14, insertion apertures 31 may be provided in the plate 16, and claw portions 27 provided at the tips of the fixing member 26 may be interlocked in the notch portions 28 provided in the insertion apertures 31. FIG. 15 is an enlarged drawing of the area around one insertion aperture 31 when the insertion apertures 31 are provided. Furthermore, it is possible to insert the tips of the fixing member 26 into the insertion aperture 31 and fix the fixing member 26 and the plate 16 without providing claw portions 27, or the correction coil 15 can be fixed by providing a slit in the plate 16 and inserting the fixing member 26.

Furthermore, providing a claw portion 27 and so on and constructing the correction coil 15 and the plate 16 to be freely detachable makes it possible to replace only

one part in case, for example, a fault occurs in either the correction coil 15 or the deflection coil, making serviceability of the CRT apparatus convenient. However, the structure is not limited to the above-described examples, but the structure may be such that the members that mount the correction coil 15 may be affixed to the plate 16 by an adhesive. This is because even this method allows for easy manufacturing of a deflection yoke.

In addition, even when an I-shaped core 30 as shown in FIG. 13 is not used, as shown in FIG. 16, if the width of the portion of the plate 16 on which the correction coil 15 is mounted is made narrower than the remainder, it is possible to conserve the material used to form the plate 16. Of course, it is possible to make the size of the plate 16 itself smaller than that shown in the drawing. Please note that the above-described examples of variations example may of course be applied in the same way when the E-shaped ferrite core 29 is used or combined with the I-shaped ferrite core 30.

Next, an example of the present invention being applied to a 46cm (19 inch), 100 degree deflection angle type display use CRT apparatus will be explained.

The CRT tube axis direction is referred to as the Z axis, and the direction along the Z axis toward the screen

is the positive direction. The position at the rear tip of the electron gun side end of the horizontal deflection coil 11 and the vertical deflection coil 12 is considered to be Z=0. If the electron gun side bend portion 17 of the vertical deflection coil 12 is within a range of Z=0 to 8mm and the plate 16 has for example a thickness of 2mm and is set in a position Z=-2 to 0mm, then, by fixing the correction coil 15 in a range of Z=2 to 4mm, the correction coil 15 is placed on the upper portion of the electron gun side bend portion 17.

As explained above, by using the deflection yoke of the present invention, it is possible to assemble a bend-up-less type deflection yoke with ease. Furthermore, if the insulating frame 13 and the plate 16 are integrally formed, a back cover which is a separate member to the insulating frame 13 that is considered to be necessary in conventional bend-up-less deflection yokes is not used, and the same fixing function as conventional correction coils can be had. Furthermore, the correction coil 15 can be set in any position by adjusting, for instance, the size of the fixing member 26 or the flange portions 25.

Please note that in the present mode, the plate 16 was used as the member for fixing the correction coil 15, but this member is not limited to a plate. Any shape is

acceptable if the member is able to fix the correction coil 15 in an appropriate position.

Furthermore, in the above-described mode, the correction coil 15 and the core 22 and so on were affixed to the fixed member 26 with an adhesive, but numerous variations are possible. For example, the correction coil 15 can be made from a component consisting of, for instance, the fixing member 26 and the flange portions 25 or the bobbin 23 integrated, and the ferrite core and the conductive wire.

Furthermore, in the above-described mode, the present invention was explained in detail when applied to a bend-up-less type deflection yoke, but the range of the present invention is not limited to a bend-up-less type deflection yoke. If the technique of the present invention is used, it is possible to place the correction coil closer to the screen side than the plate even in a bend-up type deflection yoke. This is effective when it is undesirable for the electromagnetic field of the correction coil to be leaked to the electron gun side.

Ins. A2 In addition, the applicable range of the present invention is not limited to self convergence system deflection yokes. Even in deflection yokes other than those of the self convergence system, it is possible that

it is necessary to set some kind of correction coil at the electron gun side bend portion of the deflection coil, and the technique of the present invention can be applied in such cases. Consequently, the correction coil 15 is not limited to correcting VCR and side beam vertical mis-convergence, but can be applied to various correction coils.

Industrial Application

The deflection yoke and the CRT apparatus of the present invention can be applied, for instance, to a television set or a computer display which uses particularly broad deflection angle CRT apparatus.